

ER Site No. 89: Shock Tube Site (Thunder Range)

ADS: 1335

Operable Unit: Southwest Test Area

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Site History

ER site 89 was established in Thunder Range in 1962 to support blast testing of weapon re-entry vehicles. The site was the location of the shock tube blast tests. Blast testing consisted of detonating an uncased explosive charge at one end of a tube to create an air blast wave that sweeps over a target vehicle located at the tube's other end. This blast wave creates the desired pressure loading on the target. The shock tube focuses the blast air flow, creating high blast pressures from a relatively small quantity of explosives to simulate the shock from a nuclear blast.

Many of the shock tubes were equipped with a driver section. The driver section was a unit that covered the end of the shock tube where the charge was detonated to direct the force of the explosion down the tube to the test vehicle and not out the rear of the tube. There were two types of driver sections: an expendable water-tamped section and a non-expendable concrete driver section. The expendable water-tamped section consisted of a tank of water, usually about 10,000 gallons. This absorbed the force of the shock of the explosion to the rear of the tube, and was usually destroyed. The non-expendable section consisted of a large concrete block that covered the rear of the shock tube and deflected and absorbed the shock of the explosion to the rear of the tube. This section was not destroyed, and could be reused. The non-expendable driver section also prevented the release of the explosion gases out this end of the tube.

Unlined catch pits filled with sawdust or vermiculite were constructed at the far end of the shock tubes to provide a retrieval area for the test vehicle if it was ejected from the shock tube by the explosion. The test vehicle was typically a weapon re-entry vehicle where a small quantity of depleted uranium served as a surrogate for plutonium in the weapons component of the vehicle.

Non-destructive, vulnerability tests were conducted on re-entry vehicles to prove they could survive a given shock level. The tests were designed so the test vehicle would not be destroyed. The test units might bend or break up into large pieces but would not fragment into small pieces.

The intent was to retrieve intact test vehicles to study shock effects on certain components within the re-entry vehicles.

The explosive charges used in these tests were uncased. After each test, workers were required to look for uncombusted explosives. None were reportedly found, except for one small mass of aluminum nitrate (iramite), which is an ammonium compound.

The site was operational from 1962 through the mid-1980s. The site went through several phases of construction and test activities during this time period. The South Thunder Range facility was constructed in 1965 and was originally equipped with eight expendable plywood shock tubes. These tubes were destroyed by the tests. Range improvements lead to the construction of five reusable metal shock tubes. A discussion of these different phases is as follows:

- The eight original shock tubes were constructed with expendable (plywood) materials. The tube sizes varied from 2 to 8 feet in diameter. The two largest tubes were 8 feet by 100 feet long and used 4,000 pounds of Composition B explosive for each shot (total of two). The test vehicles were recovered after each test. The six smaller tubes used 60 pounds of Composition B for each test. In the early 1960s, the expendable tubes were replaced with reusable steel tubes: a 6-foot diameter by 50-foot tube (XT-8), a 6-foot diameter by 200-foot tube (XT-9), and a 2-foot diameter by 200-foot tube (XT-10).
- The XT-8 was a non-expendable steel tube used for testing Mk-12 re-entry vehicles. The tube was equipped with an expendable water-tamped driver section. An uncased charge of 500 pounds of concentrated explosives, probably 2,4,6-trinitrotoluene (TNT), cyclotetramethylene tetranitramine (HMX), and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) derivative, was placed inside the tube where it was sealed at one end by the driver plate. A total of 2,500 pounds of explosives may have been detonated during five tests conducted in this tube.
- The XT-9 was a non-expendable steel tube used for testing Air Force Mk-21 and Mk-12a and Navy Mk-3, Mk-4, and Mk-5 re-entry vehicles. The explosives used for testing were gas mixtures or primacord (or C-4). An explosive charge (maximum 500 pounds per test) was placed just inside one end of the shock tube, and the re-entry vehicle was discharged into a catch pit. A total of 15,000 pounds of explosives were estimated to have been discharged from this tube.
- The XT-10 was originally located near Building 9964 at the Beryllium Firing Site ([ER Site 90](#)). The XT-10 was relocated to Site 89 and was later combined with the 19-foot diameter tube described below. This tube was designed to perform tests on scale models. The XT-10 was constructed with flanged Schedule 40 and 80 pipe. The explosives used for each test were PETN, primacord, and concentrated or explosive gas. A total of 1,750 pounds of explosives were estimated to have been discharged in this tube.
- Additionally, a 19-by 65-foot shock tube was constructed and operational from 1969 to 1975 for testing Sprint Interceptor re-entry vehicles. The number of tests and the amount of explosives used is unknown.

From 1975 to 1981 the shock tube testing program was suspended. The shock tube equipment was not used and was abandoned in place during this time period. Testing resumed in 1982.

- With the resumption of testing, the 19-foot diameter tube was lengthened from 65 to 580 feet. Thirty shots were fired through the tube. Explosive charge weight varied from 100 to 1,100 pounds, with an average of 200 pounds per shot. The estimated total amount of explosives (PETN) used was 6,000 pounds.
- A 6-by 80-foot steel shock tube was constructed after 1982 to test the Mk-21, the Trident 2, and the Mk-5 re-entry vehicles. A C-4 explosive charge (200 pounds) set up outside the tube was detonated for each test. A total of 1,600 pounds of C-4 explosive was estimated to have been used during eight tests.
- A 12-by 80-foot non-expendable blast tube also was constructed in 1982. The tube was built from Space Shuttle solid booster motor cases and was used to test the hardness of interceptor motor cases. A C-4 explosive charge (200 pounds) set up outside the tube was detonated for each test. A total of 2,400 pounds of C-4 explosive was estimated to have been used during twelve tests.

These three testing programs were completed in 1985. No new testing has been conducted at this site since the completion of these programs. The stock tubes were dismantled by 1995 except for the 19 foot diameter section.

The terrain in the vicinity of the site is flat to gently sloping, and open. Shallow arroyos transect the area. Precipitation is low in the region; surface runoff is minimal. Alluvial deposits underlie the site to an undetermined depth. The site occurs in an area of considerable structural subsurface complexity and may be intersected by several faults in the area.

Constituents of Concern

DU

Beryllium

HE

Lead

Current Hazards

There are no current hazards at this site related to contamination of the surface or subsurface soils. There are structures or stored materials that remain at the site that are a potential hazard.

Current Status of Work

A risk-based no further action (NFA) proposal was submitted to New Mexico Environment Department (NMED) in August 1997. In December 1999, following review of SNLs response to a Request for Supplemental Information (RSI), NMED indicated that the site was acceptable for NFA approval. The NFA was approved by NMED in July 2000 after completing the public review and permit modification process.

Future Work Planned

No additional work is planned.

Waste Volume Estimated/Generated

No waste was generated.

Information for ER Site 89 was last updated Jan 22, 2003.